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## Katz' ADL index assessed functional performance of Turkish, Moroccan, and Dutch elderly

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### Abstract

**Background and Objective:** We examined the reliability and validity of self-reported limitations encountered in the activities of daily living (ADL) as measure of functional performance, for Turkish, Moroccan, and indigenous Dutch elderly in the Netherlands.

**Methods:** We obtained data on self-reported ADL measured by Katz' ADL index and on five related health outcomes among a general population sample of 304 Dutch, 330 Turkish, and 299 Moroccan respondents aged 55–74 years, in Amsterdam, the Netherlands (response: 60%).

**Results:** Katz' ADL index demonstrated good internal consistencies for each ethnic group (Cronbach's alphas: 0.84–0.94). Regarding validity, the ADL index showed relatively strong associations with related outcomes, that is, long-term limitations in mobility and SF-36 physical functioning (rank correlations: 0.64 and –0.60, respectively). Associations with more general health outcomes, number of chronic disorders, Center for Epidemiologic Studies-Depression scale symptoms, and SF-36 role performance were weaker, as expected. Associations were stronger for Moroccans than for indigenous Dutch elderly regarding both SF-36 outcomes and depressive symptoms.

**Conclusion:** Katz' ADL index is valid to assess functional performance of Turkish, Moroccan, and Dutch elderly, but comparisons with Moroccan elderly should be handled with caution. The explanation of these findings and their generalizability to other ethnic groups deserve further study. © 2007 Elsevier Inc. All rights reserved.

**Keywords:** Ethnic group; Functional status; Cross-cultural comparison; Psychometrics; Netherlands; Turkey; Physical fitness

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### 1. Introduction

Health problems among older immigrants from nonindustrialized countries are a rapidly increasing challenge for public health in most industrialized countries. Due to political and economic developments, the numbers of immigrants are growing [1,2]. Moreover, when compared to the indigenous population, rates of health problems such as cardiovascular, musculoskeletal, and mental health disorders are high among immigrant groups and are likely to further increase because of the aging of these groups [1–5]. Explanatory factors may be poor working conditions [2,3], lack of physical activity [6], and difficulty in adapting to the new cultural environment which, in turn, hampers access to care [7]. Such health problems often lead

to long-term functional limitations and high needs for health care [8–11].

In the Netherlands, immigrants from Turkey and Morocco constitute major groups. In 2004, 2.2% of the Dutch population was of Turkish descent (i.e., at least one parent born in Turkey), and 1.9% of Moroccan descent; in the main Dutch cities, their share is much higher (<http://statline.cbs.nl>, accessed March 2, 2005). They came to the Netherlands as labor migrants in the 1960s and early 1970s, firstly only men on a temporary basis. However, most of them stayed and their families were subsequently reunited with them. Both groups are rather homogenous culturally, almost entirely of Islamic background [12], and relatively young. However, the cultural distance to indigenous Dutch is somewhat smaller for Turkish immigrants than for Moroccan immigrants. The latter are rated less favorable by indigenous Dutch than Turkish immigrants (36 vs. 43 on a rating scale from 0, least favorable, to 100, most favorable) [13]. Moreover, Turkish immigrants have instituted relatively more organizations than Moroccans [14].

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For instance, in the city of Amsterdam, the number of organizations per 1,000 immigrants is almost twice as high for Turkish immigrants (5.6) compared to Moroccan immigrants, and the same applies for voter turnout (39% vs. 23%) [15]. Finally, Turkey has a relatively long history of a formal separation between religion and state that also exists in the Netherlands, whereas in Morocco the king still has a number of religious tasks [14].

The health status of both immigrant groups has been shown to be poorer than that of indigenous Dutch [3–5]. For instance, long-term limitations measured by the Organization for Economic Co-operation and Development (OECD) indicator [16] occurred much more frequently among first-generation Turkish and Moroccan immigrants aged 16–64 years than among indigenous Dutch in the same age group (odds ratios [95% confidence interval (CI)]: 13.1 (8.2–20.9), and 8.2 (5.4–12.3), respectively) [4].

Self-reported limitations in activities of daily living (ADL) are often used to assess functional performance, both in research and in daily care and mostly measured by the ADL index of Katz et al. [17]. This index was first tested among patients in hospitals, where clinicians rated patients' ability to perform six tasks. Nowadays, the index is commonly used to measure the functional status of community dwelling, noninstitutionalized, elderly individuals, either in its original set-up or with adaptations, and also as a self-report measure instead of an assessment tool for clinicians.

Despite the frequent use of the Katz' index, evidence on its reliability and validity is limited [18–21]. Evidence on its cross-cultural validity lacks even though the index and its various adaptations have been used to compare ethnic groups [8,11,22–27]. This is especially questionable when people with a very different cultural background are to be compared.

A first question to be answered in this case is whether data that are acquired with an instrument are equivalent across ethnic groups. Herdman et al. provided a model to assess this equivalence, starting from the assumption that constructs to be measured are not automatically the same across cultures [28]. Though they described this model in conjunction with the measurement of health-related quality of life, it may be also applied to the measurement of ADL. The model of Herdman et al. consists of six types of equivalence, which can logically be applied one after the other: conceptual; item; semantic; operational; measurement; and functional equivalence [28]. The first two types refer to whether domains are of importance for the target cultures, and whether items to measure these domains are similarly relevant across cultures. Semantic equivalence concerns the similar meaning of the translation of these items. Operational equivalence concerns the (similar) appropriateness of measurement methods in the various cultures, which should lead to equivalent measurements in terms of instrument behavior. Cultural equivalence

regarding these five aspects should then lead to a full functional equivalence of an instrument.

The aim of this study is to examine the reliability and validity of self-reported limitations in ADL among Turkish and Moroccan elderly, when compared to indigenous Dutch elderly. As such, it provides new evidence on the operational and measurement equivalence of Katz' ADL index, but was based on the available evidence regarding the hierarchically lower types of equivalence.

## 2. Methods

We analyzed data on limitations in ADL from a community survey among Amsterdam elderly aged 55–74 years.

### 2.1. Subjects

Subjects came from a random sample of the Amsterdam municipal population register (MPR), stratified by age and excluding people living in care institutions. Registration of residents in this register is obligatory, including country of birth. The original sample comprised residents aged 16 years and older, excluding people living in care institutions, with oversampling of Turkish and Moroccan people between 35 and 74 years old. Because limitations in ADL occur mostly among elderly, the survey included only those between 55 and 74 years in the interviews on this topic. This concerned 304 Dutch, 330 Turkish-born, and 299 Moroccan-born respondents, 61% of the Dutch sample and 60% of the Turkish and Moroccan sample. Response rates did not vary by marital status for the ethnic groups studied.

### 2.2. Data and data collection

Trained interviewers asked respondents about their health, limitations in ADL, and socioeconomic and demographic background. About 1 week before the intended interview, potential respondents received a personal letter signed by the director of the Municipal Health Service on the aim of the interview and its intended date and time. A translation in Turkish or Moroccan-Arabic was enclosed, depending on the registered country of birth. This procedure was based on interviews with people from the target groups, and on evaluations of previous surveys among them [4]. All written material was translated to Turkish and Moroccan-Arabic by certified translators and backward translated by other ones afterwards, to assure semantic equivalence. Discrepancies between the original and the backward translated versions were subsequently resolved by experts, to assure both item and semantic equivalence [29]. People were called on five times if they were not at home at the intended time of the interview. Moroccan and Turkish respondents were matched to interviewers of the same ethnic group and gender to prevent culture-related problems during the interviews including embarrassment

because of being interviewed by a person of the opposite gender, that is, measurement equivalence [28]. The study design was approved by the local Medical-Ethical Committee.

ADL was assessed using an adapted version of Katz' questionnaire [17] that contained six items on the ability to perform activities for daily personal care and four items on mobility (see Appendix). Respondents who were not able to perform an activity without help or only with very large difficulties were considered to be limited regarding that activity. Next, the number of limitations was counted, yielding a score ranging from 0 to 10. If data on three or more items were missing, no score was recorded.

Health status was assessed with five measures, that is, chronic disorders, depressive symptoms, long-term limitations in mobility, physical functioning (PF), and role limitations. *Chronic disorders* concerned the occurrence of at least one out of eight chronic disorders that have been shown to limit PF, during the preceding year: osteoarthritis, rheumatism, chronic back complaints (including hernia), myocardial infarction, other severe heart diseases (like angina pectoris and heart failure), diabetes mellitus, chronic obstructive pulmonary disease (including bronchial asthma, chronic bronchitis, and emphysema), and stroke [9]. Next, the number of chronic disorders was counted, yielding a score ranging from 0 to 8. No score was reported if one or more items were absent.

*Depressive symptoms* were assessed using the Center for Epidemiological Studies-Depression scale (CES-D) [30–33]. The CES-D contains 20 items that can all be scored as never (0), sometimes (1), often (2), or always (3), yielding a score between 0 and 60. Its utility has been shown for all ethnic groups that were comprised in this study [33]. No score was recorded if the answers “always” or “never” were given throughout or if five or more of the items were unanswered. If four or less items remained unanswered, the missing values were replaced by the mean score for the remaining items [30,31].

*Long-term limitations in mobility* were assessed using the 3-item OECD mobility scale [4,16]. All limitations reported by each respondent were totaled to give a score ranging from 0 to 3. No score was reported if one or more items were missing.

*PF and role limitations* due to physical restrictions were measured using the 10-item PF subscale and the 4-item physical role functioning (RP) subscale of the SF-36 Health Survey, respectively [34,35]. For all SF-36 items, scores ranged from 1 (for most, or all of the time) to 6 (for none [of the time]). Scores on items were added up and converted into a scale ranging from 0 (worst possible state) to 100 (best possible state) [34,35]. Following Ware et al. [34], scores on missing items were replaced by the mean score for the remaining items, except if more than half the items were missing, which led to a missing score.

Data on *socioeconomic and -demographic background* concerned gender, age, marital status, length of stay in

the Netherlands, highest level of education (primary school or less vs. beyond), income level (below the poverty line vs. higher), and ethnicity (Dutch, Turkish, and Moroccan). Indigenous Dutch concerned people born in the Netherlands with both parents also born in the Netherlands. Turkish and Moroccan ethnicity comprised people born in the country concerned themselves, with almost always both parents born in that country too. All countries of birth referred to the countries recorded in the Amsterdam MPR.

### 2.3. Analysis

We first examined ADL scores by ethnic group. Differences in frequency distributions between ethnic groups were tested using the nonparametric Kruskal–Wallis test [36]. Next we examined differences in internal consistency reliabilities by ethnicity based on Cronbach's alpha. Finally, we examined the (criterion) validity of the ADL index by assessing the Spearman's rank correlation coefficients between the ADL scores and the five related health outcomes:

- two outcomes that should measure a (partly) corresponding concept, that is, the OECD long-term limitations in mobility and SF-36 PF;
- three outcomes that should measure aspects of health status that could be assumed to affect the ability to perform ADL, that is, the number of chronic conditions and of CES-D depressive symptoms, and SF-36 role limitations because of physical restrictions (RP).

We repeated the latter analyses with adjustment for differences in age and gender, and with a restriction to the lowest educational level group, to explore whether differences in educational level offer an explanation for ethnic differences. Analyses were done with SPSS 12 for Windows (SPSS Inc., Chicago, IL) (Tables 1 and 2) and SAS 8.02 for Windows (SAS Institute Inc., Cary, NC) (Table 3).

Table 1  
Sociodemographic characteristics of the study population by ethnic group

	Dutch	Turkish	Moroccan	Total
Number of respondents	304	330	299	933
Men (%)	44.4%	49.7%	56.2%	50.1%
Aged 65–74 years (%)	59.2%	44.5%	53.5%	52.2%
Age [mean (standard deviation, SD)]	65.4 (5.9)	63.5 (5.0)	64.9 (4.8)	64.6 (5.3)
Married (%)	54.6%	82.1%	84.6%	74.0%
Income at poverty line or below (%)	17.5%	51.5%	77.4%	47.4%
Only primary education or less (%)	28.4%	95.8%	98.7%	74.8%
Years living in the Netherlands [mean (SD)]*	n.a.	27.0 (10.6)	25.3 (9.6)	26.0 (10.2)

\*Differences by ethnicity were statistically significant ( $P < 0.0001$ ; Kruskal–Wallis test).

n.a. indicates not applicable.

Table 2

ADL scores by ethnic group: number of respondents means, standard deviations (SD), observed minimum and maximum scores and percentage of respondents concerned, and Cronbach's alphas ( $\alpha$ )

Ethnicity	Number	Mean	95% CI	Minimum (%)	Maximum (%)	$\alpha$ (n)
Dutch	303	0.21	0.13–0.29	0 (90.5%)	5 (1.0%)	0.84
Turkish	330	0.99	0.77–1.20	0 (68.8%)	10 (0.9%)	0.92
Moroccan	299	1.34	1.07–1.62	0 (69.5%)	10 (1.0%)	0.94
All respondents	932	0.85	0.73–0.97	0 (72.9%)	10 (0.6%)	0.93

### 3. Results

#### 3.1. Background characteristics

The sociodemographic characteristics of all 933 responding elderly are summarized in Table 1. Characteristics of respondents reflected the position of all Amsterdam residents from the three ethnic groups concerned. In particular, very few Turkish and Moroccan respondents had more than primary education, and most had family incomes below the poverty line.

#### 3.2. ADL scores: means and reliabilities

None of the respondents missed more than two items of the ADL index, indicating good acceptability. Mean ADL scores were higher for Turkish and Moroccan elderly than for indigenous Dutch elderly ( $P < 0.0001$ ; Kruskal–Wallis test) (Table 2). Differences by ethnicity were hardly influenced by adjustment for age and gender (not shown). Ranges of scores were much wider for Turkish and Moroccan elderly than for indigenous Dutch elderly. Internal consistency reliabilities were good for all ethnic groups, being

slightly higher for Turkish and Moroccan elderly than for indigenous Dutch ( $P > 0.05$ ).

#### 3.3. Validity

The criterion validity was tested according to the correlations between the ADL scores and the five related health outcomes as criteria. Table 3 shows the correlation coefficients and the 95% CIs. The ADL index correlated relatively strongly with the two (partially) corresponding scales, that is, the OECD long-term limitations in mobility scale (0.64) and SF-36 PF (–0.60), and moderately with the other three health outcomes. Correlations were stronger with statistical significance for Moroccan elderly than for others regarding SF-36 PF, CES-D depressive symptoms, and SF-36 role restrictions because of physical restrictions. Adjustment for age and gender changed correlation coefficients very little (maximum absolute change 0.04, not shown), except for that with SF-36 physical functioning (both from –0.47 to –0.60). A restriction to the lowest educational level did not influence correlation coefficients for Turkish and Moroccan elderly (not shown), but increased most of them somewhat for indigenous Dutch (Table 3).

Table 3

Spearman correlation coefficients and 95% CIs between the ADL indicator and five related health measurements, by ethnicity

	Dutch	Dutch of low educational level	Turkish	Moroccan	Total
Chronic conditions	0.24 (0.13 to 0.35)	0.32 (0.11 to 0.49)	0.29 (0.19 to 0.39)	0.34 (0.23 to 0.44)	0.35 (0.29 to 0.40)
<i>N</i>	292	81	319	294	905
CES-D depressive symptoms	0.27 (0.16 to 0.37)	0.21 (–0.01 to 0.40)	0.27 (0.16 to 0.37)	0.53 (0.44 to 0.61)*	0.41 (0.35 to 0.46)
<i>N</i>	304	86	314	295	913
OECD limitations in mobility	0.60 (0.52 to 0.67)	0.67 (0.53 to 0.77)	0.59 (0.51 to 0.66)	0.66 (0.59 to 0.72)	0.64 (0.60 to 0.68)
<i>N</i>	303	86	330	298	931
SF-36 physical functioning	–0.47 (–0.55 to –0.38)	–0.58 (–0.71 to –0.42)	–0.49 (–0.58 to –0.40)	–0.70 (–0.75 to –0.64)**	–0.60 (–0.64 to –0.56)
<i>N</i>	304	86	330	299	933
SF-36 role performance	–0.28 (–0.38 to –0.17)	–0.20 (–0.39 to 0.01)	–0.37 (–0.46 to –0.27)	–0.50 (–0.58 to –0.41)***	–0.44 (–0.49 to –0.38)
<i>N</i>	304	86	329	299	932

*N*, number of respondents for the analyses.

\*Significant differences between the Moroccan elderly and the Turkish elderly ( $P < 0.001$ ), and the Moroccan elderly and the Dutch-born elderly, the latter regarding all ( $P < 0.001$ ), and regarding those with low educational level ( $P < 0.01$ ).

\*\*Significant differences between the Moroccan elderly and the Turkish and Dutch-born elderly ( $P < 0.001$ ), the latter not after restriction to low educational level.

\*\*\*Significant differences between the Moroccan elderly and the Dutch-born elderly, both for all ( $P < 0.01$ ) and for those with low educational level ( $P < 0.01$ ).



It should be realized though that this concerns a relatively small group.

## 4. Discussion

The results of this first study on the reliability and the validity of self-reported physical functioning measured by Katz' ADL index show that this has good internal consistency and good acceptability, with only slight variation across elderly of the three ethnic groups studied. The criterion validity of the ADL index was reasonable, shown by moderate associations in the expected directions with five related health outcomes. However, some associations were stronger for Moroccan elderly than for Turkish and indigenous Dutch elderly. Among Dutch elderly, they were mostly slightly better for those with low educational status.

### 4.1. Strengths and limitations

When interpreting the results of our study, its strengths and limitations should be taken into account. Important strengths concern its community-based nature and the inclusion of a large sample of two well-defined ethnic minority groups, Turkish and Moroccan elderly, who could be directly compared to elderly indigenous Dutch people from the same population.

A potential limitation of the study concerns the nonresponse of almost 40%. However, nonresponse was similar across the three ethnic groups that we studied and did not vary by marital status, which limits the likelihood of selection bias. Moreover, response rates were virtually the same as in a previous study with a similar methodology [4]. In that study, we performed a more extended nonresponse analysis (on gender, age, marital status, position in family, year of settlement in Amsterdam, borough of residence, and period of interview) that did not show any indication of selectivity in the nonresponse across the various ethnic groups [4,37].

The use of only self-report measures as criteria regarding validity may be considered as a second limitation of our study. Theoretically, differences in response styles between ethnic groups that are consistent across questionnaires might also lead to a similar association of responses on the ADL index and the self-reported health measures that we used as criteria. For instance, some ethnic minority respondents may in general provide socially desired answers or select extreme answer categories more frequently [21,38–40]. The available evidence regarding this is not equivocal, however [41–43], implying that additional research is needed on this subject with inclusion of performance tests, over and above self-report [43,44]. However, it should also be realized that the main impetus for seeking care derives from the perceptions people have of their limitations, which implies that subjective criteria should be considered too, in addition to performance tests.

Moreover, some of the health outcomes that we studied, especially CES-D depressive symptoms and SF-36 role performance may also be considered to be a result of poor functional status, instead of its cause. This idea also enables the accommodation of other causes of, for instance, the high mean CES-D scores among Turkish and Moroccan immigrants in the Netherlands [45]. However, it would lead to identical analyses and results as we presented.

### 4.2. Previous evidence and explanations

Our results correspond with the findings of the few previous studies on the reliability and validity of the Katz' ADL index, and its adaptations. Regarding internal consistency, Spector et al. reported Cronbach's alphas of Katz' ADL index ranging from 0.73 to 0.78 in a secondary analysis of data from three studies [18]. Reuben et al. found much lower Cronbach's alpha of only 0.56 for a modified Katz' index [19]. Sonn combined Katz' index with questions on certain instrumental activities, the so-called ADL staircase, and reported a Cronbach's alpha of 0.84 for the Katz index (and of 0.90 for the entire "ADL-staircase") [20]. Rodgers and Miller reported a Cronbach's alpha of 0.89 for with their modified ADL index—containing the same items as the Katz index but differently worded [21].

Regarding the criterion validity of the ADL index, previous studies are even sparser and none focused on ethnic differences. Reuben et al. found a weak correlation (0.30) between a modified Katz' index and the subscale PF of the SF-36 [19]. Rodgers and Miller found a correlation of 0.36 between a fairly standard set of six ADLs, comparable with Katz' index and the summed number of chronic conditions [21].

Our results show that Moroccan elderly differ from both Turkish and indigenous Dutch elderly regarding the validity of Katz' ADL index, both overall and in an analysis restricted to the lowest educational level. Thus, being an immigrant from a nonindustrialized country into an industrialized country is not a sufficient explanation for this difference. In this respect, self-reported functional performance differs from utilization of health care, for which criterion-related validity was somewhat lower among both Moroccan and Turkish immigrants, when compared to indigenous Dutch [46]. Differences in age, gender and educational status do not explain these differences, although a lower educational level seems to be associated with a slightly better validity of the Katz' index. It remains to be seen which other factors do explain the differences, especially those between Moroccan and Turkish elderly. Obvious differences between these groups are that Turkey used to be more western orientated than Morocco, at least in the period that these elderly lived in their country of origin. For instance, the Turkish educational system was more orientated on Western Europe than the Moroccan system, and schooling was provided on a more general basis in Turkey than in Morocco. Poor literacy may thus be an

explanation of our findings [47]. Moreover, Moroccans have a lower level of organizational membership [15], receive a lower rating from indigenous Dutch people than Turks [13], and differ more from indigenous Dutch regarding the separation between religion and state and regarding individualism than Turks [14].

These cultural differences could explain some of our findings, as they may lead to a different conceptualization of ADL. As an example of this, Herdman et al. mention that firstly getting dressed may actually involve a different series of movements in different cultures, due to different clothing [28]. Moreover, the inability to dress oneself may be perceived as more serious in some cultures than in others. Actually, we did not assess these potential conceptual differences between the cultures involved because Katz' index has already been used frequently in the groups involved [8,11,22–27]. One interpretation of our results may be, however, that we reached cultural equivalence in four of the first five steps of equivalence but not in overall function, implying that cultural differences in conceptualization may offer the explanation in this case. Additional research is needed to examine this explanation, taking into account that the overall cultural distance to indigenous Dutch is probably smaller for Turkish immigrants than for Moroccan ones.

#### 4.3. Implications for practice and research

ADL is commonly used to assess the functional ability of the elderly, both in clinical care, for instance, to determine their needs regarding devices, assistance from caregivers or institutional care, and in research. Regarding clinical care, our results support the notion that assessing self-reported ADL provides an acceptable, reliable, and valid measure of functional status. Regarding research, the same holds if separate ethnic groups are studied, but the use of self-reported ADL to compare the functional abilities of Moroccan elderly with those of Turkish and indigenous Dutch elderly requires caution. The explanation of the latter finding deserves further study. Moreover, our findings need to be confirmed by other studies carried out among other ethnic groups, as this is the first study to be done on ethnic differences in the validity of self-reported functional performance.

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#### Appendix

##### Items of the Katz index as included in the study

I will now mention some activities that some people find difficult to perform. Some of the following questions may resemble previous ones, but they are actually slightly different. We hope you will answer these questions. Please use card to indicate whether you can do these things without any difficulty, with some difficulty, with great difficulty, or only with the help of others.

(Instruction for interviewer: please call categories if difficulties in reading)

1. Eating and drinking.
2. Sitting down on and getting up from a chair.
3. Getting into or out of bed.
4. Getting dressed or undressed.
5. Going to another room on the same floor.
6. Going up or down the stairs.
7. Leaving or entering the house.
8. Moving about outside the home.
9. Washing your face and hands.
10. Washing your entire body.

##### Response categories for all questions

- A. without any difficulty
- B. with some difficulty
- C. with great difficulty
- D. only with the help of others

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